Simple 21E1-155M-SDH

User Manual

Simple 21E1-155M-SDH

Single-Board SDH Optical Transmission System

V1.1

Jan. 2005

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1. Simple 21E1-155M-SDH System Brief

1.1 Outline

Simple 21E1-155M-SDH is a high capacity optical transmission system based on ASICs. It provides 2x155.52Mb/s aggregate line interfaces of A and B, possessing VC-3/VC-12 non-blocking cross-connecting and channel protection function. Simple 21E1-155M-SDH is used as a terminal or an ADM in a short line (less or equal to 5 NEs); **it can multiplex 21xE1 to the optical line port at most**. **It dose not support the ring network.**

The Network element management system is based on unified network management platform SDHNMS. SDHNMS is designed in accordance with related recommendations of ITU-T, so as to realize network resources, equipment configuration, alarm, performance and security management; it can support unified management of multiple optical-route non-interconnected sub-net, and support remote network monitoring by way of Internet. **SDHNMS do not provides the history Alarm records and the performance records for the Simple SDH System.**

Table 1-1 SDH system

No.	Model	Product Description
1	OS155S8J	Simple 8E1-155M-SDH
2	OS155S16J	Simple 16E1-155M-SDH
3	OS155S21J	Simple 21E1-155M-SDH
4	OS155S42J	Simple 42E1-155M-SDH
5	OS155S63J	Simple 63E1-155M-SDH
6	OS8614	SDH optical transmission system Rack

1.2 Product Features

- World leading design adopts independent ASICs, with 1U single-board structure, compactness, high reliability, low power consumption;
- Provides 63 x 63 VC12 non-blocking cross-connect, supports tributaries Add/Drop of 1~21 x E1, with capability of unidirectional and bi-directional multiplexing;
- Supports networks of point to point and simple chain providing functions like tributaries 1+1 channel protection;
- Provides Engineer Order Wire (EOW) interface (two-line model), with dial and meeting call functions;
- Supports TCP/IP for network management;
- Provides F (Ethernet) and f (RS232) NMS interface;
- **Do not provides the historic alarm records and the performance records;**
- By changing the optical transceiver, it supports ultra-long distance (≤80km), long distance (≤50km) and short distance (≤30km) transmission;
- Equipment adopts natural wind heat emission, with stable and reliable work.

- **Supports the Free-Running timing mode, the standard G.813 timing modes are absent.**

1.3 Technical Specifications and Standards (ITU-T series)

G.703 Physical/electrical characteristics of hierarchical digital interfaces.
G.823 Control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy.

2. Equipment Interface

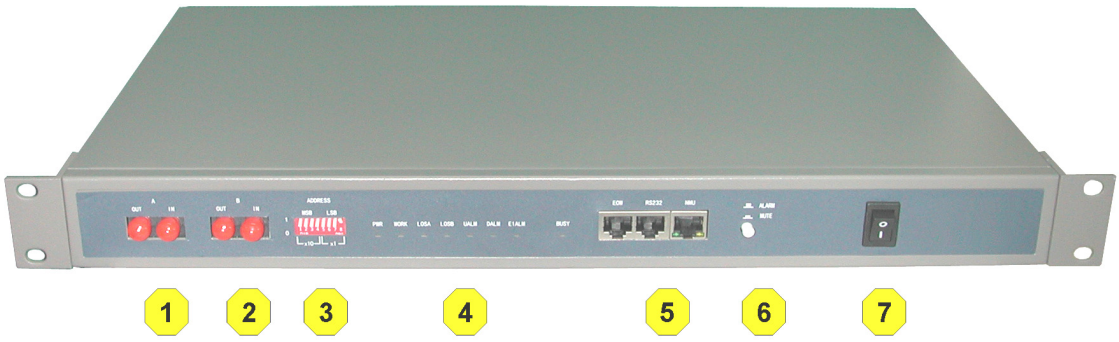
Simple 21E1-155M-SDH is a 19''-1U single-board design, with complete functions and compact structure, can be conveniently installed on 19''wide equipment rack. The equipment can meet shock, heat emission and EMC, etc. multiple national standard specifications and requirements. The front panel is arranged with various indicating lights and the control and management interfaces; while the power interfaces and the transmission interfaces are focused on the back panel of the equipment. Description of the front panel is shown in Fig. 2-1.

2.1 Equipment running state and alarm indicator lights

Table 2-1 Simple 21E1-155M-SDH indicating lights

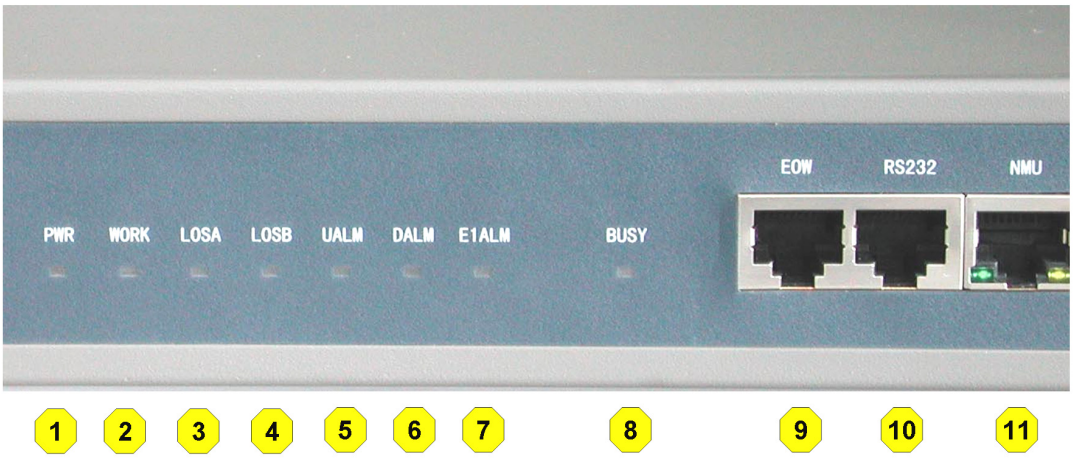
Name	Paraphrase	Effective status	Remarks
PWR	Equipment power-on indication	Green light is on	Switch disconnected/power invalid/reverse connection of polarity/blowout
WORK	Equipment operation indication	Green light is flashing	
LOS1	Optical port A signal LOSS	Red light is on	Flashing represents a LOF
LOS2	Optical port B signal LOSS	Red light is on	Flashing represents a LOF
UALM	Equipment urgency alarm	Red light is on	LOS (Loss of Signal) LOF (Loss of Frame) MS_EXC (Multiplex Section Excessive Error) AU_LOP (AU Loss of Pointer) LOM (Loss of Multi-frame) HP_PLM (High Order Path Payload Mismatch) HP_TIM (High Order Path Trace Identifier Mismatch) HP_EXC (High order Path Excessive Error) TLOS (Tributary Loss)

Name	Paraphrase	Effective status	Remarks
DALM	This end equipment appears non-urgency alarm, or alarm or performance deterioration, or branch circuit failure caused by opposite end equipment failure	Red light is on	MS_AIS (Multiplex Section AIS) MS_RDI (Multiplex Section Remote Defect Indication) MS_DEG (Multiplex Section degraded) AU_AIS (AU AIS) HP_AIS (High Order Path AIS) HP_RDI (High Order Path Remote Defect Indication) EXCEED (High Order Error Code Overrun, including B1/B2/B3/out of limit) TU_LOP (Tributary loss of pointer) TU_AIS (Tributary AIS) LP_RDI (Low order Path channel RDI) LP_PLM (low order Path Payload Mis-match) LP_AIS (Low Order Path AIS) LP_EXCEED (Low Order Path Error Code Overrun, including BIP-2 out of limit) TAIS (Tributary input AIS)
E1ALM	Lights up when any of E1 Loss	Red light is on	
BUSY	Lights up when EOW ringing	Green light is on	



1. Optical port A (FC);
2. Optical port B (FC);
3. NE address switch;
4. Operating state and alarm indicator lights;
5. Management and EOW (Engineer Order Wire) interface (RJ-45);
6. Alarm mute switch.
7. Power switch.

Fig. 2-1-1 The front panel



1. **PWR** Operating indicator;
2. **WORK** Operating indicator;
3. **LOSA** Signal loss of optical port A, it also represents a LOF when flashing;
4. **LOSB** Signal loss of optical port B, it also represents a LOF when flashing;
5. **UALM** Urgent alarm indicator;
6. **DALM** Non-urgent alarm indicator;
7. **E1ALM** Signal loss of E1tributary;
8. **BUSY** EOW call indicator.
9. **EOW** Engineer Order Wire interface (RJ-45);
10. **RS232** NMS & User transparent serial interface (RJ-45);
11. **NMU** Ethernet network management interface (RJ-45).

Fig. 2-1-2 The indicators of the front panel

In SDH system, for the network management, each equipment should take an inherent hardware address. The address is set by the switch manually. The coding method is simple BCD, while the address could be “00”~”99” in decimal.

EXP: NE Address=01.

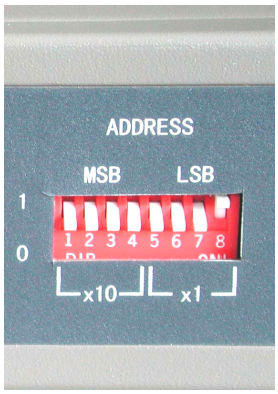


Fig. 2-1-3 The NE address switch

2.2 Control and Auxiliary Service Interfaces

2.2.1 EOW (Engineer Order Wire) interface

Simple 21E1-155M-SDH equipment adopts standard 2-line telephone set as EOW telephone, whose cable that connected to equipment end is tailor-made: one end is RJ-11 connection telephone set; another end is RJ-45 connection Simple 21E1-155M-SDH equipment. The interface definition is as shown in the following Figure.

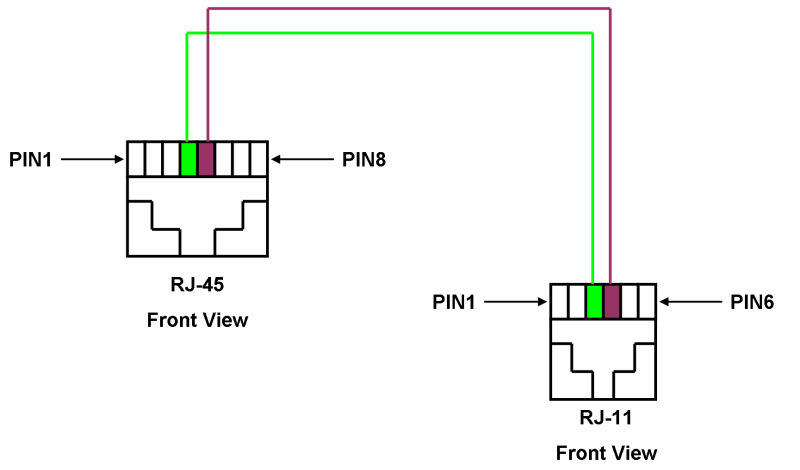


Fig. 2-2-1-1 EOW cable

Table 2-2-1 EOW telephone interface

No.	Definition	Remarks
PIN1~3		Not connected
PIN4	TIP	
PIN5	RING	
PIN6~8		Not connected

The EOW card is used to provide the Order Wire function. It would be installed inside Simple 21E1-155M-SDH after the client has ordered it.

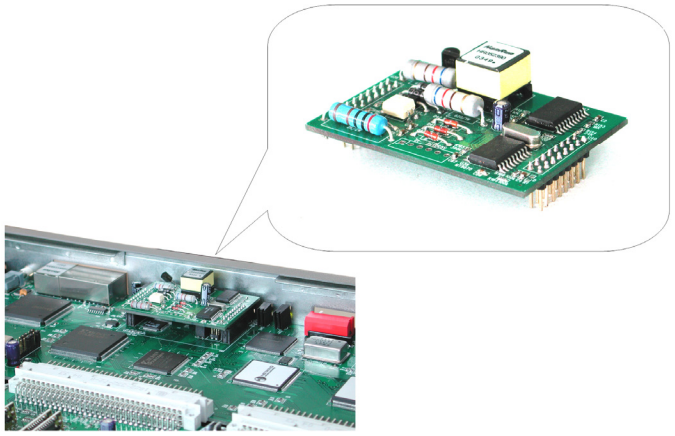


Fig. 2-2-1-2 EOW card

2.2.2 Serial network management and user channels

Simple 21E1-155M-SDH uses the same RJ-45 socket to lead out serial NMS (Network Management Station) and user serial interface, and uses dedicated serial interface cable: two ends are DB9 plugs; another end is RJ-45 to connect Simple 21E1-155M-SDH equipment. The cable's linear ordering structure is as shown in the following Figure.

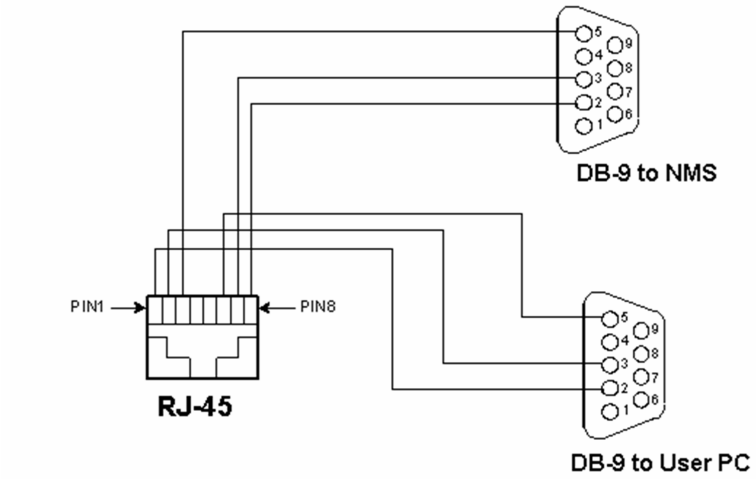


Fig. 2-2-2 Serial interface structure

Table 2-2-2 RS232 serial interface definition (RJ-45 end)

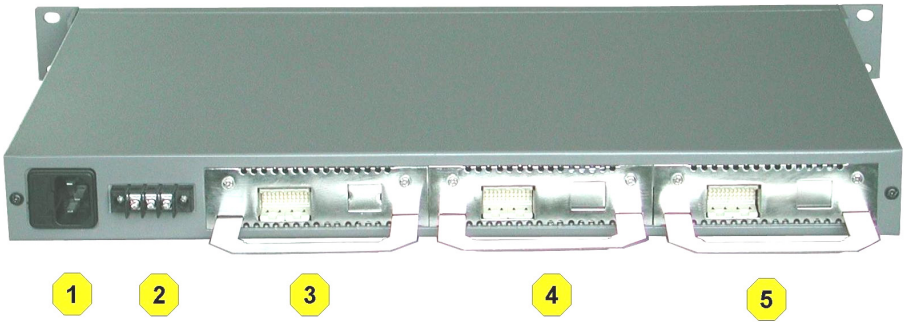
No.	Definition	Remarks
PIN1	Data-IN	Serial data output
PIN2	Data-OUT	Serial data input
PIN3	RSNM-LINK	Serial network management connection indication
PIN4		Not connected
PIN5		Not connected
PIN6	GND	Signal ground
PIN7	RSNM-IN	Serial network management channel input
PIN8	RSNM-OUT	Serial network management channel output

2.2.3 Ethernet NMS interface (NMU)

Apart from providing RS232 serial NMS port, it is also recommended to use Ethernet NMS port. The equipment provides NMS port on the front panel, which is used for connecting NMS. While connect to a NIC (Network Interface Card), it uses a standard UTP crossover cable (CAT-5); while connect to an Ethernet switch, it uses a straight-through cable.

2.3 Main service and power interfaces

The main service interfaces include two STM-1 optical ports and 21xE1 tributary electrical interface. J type contains only one optical port.



1. ~220VAC power interface;
2. -48VDC power interface;
3. 8 x E1tributary interface (#1~8);
4. 8 x E1tributary interface (#9~16);
5. 8 x E1tributary interface (#17~21).

Fig. 2-3-1 Simple 21E1-155M-SDH back panel

Simple 21E1-155M-SDH adopts 2mm high-density connector to lead out E1 tributaries from back panel; description and annotation of related E1 tributary interfaces are shown in following Figure.

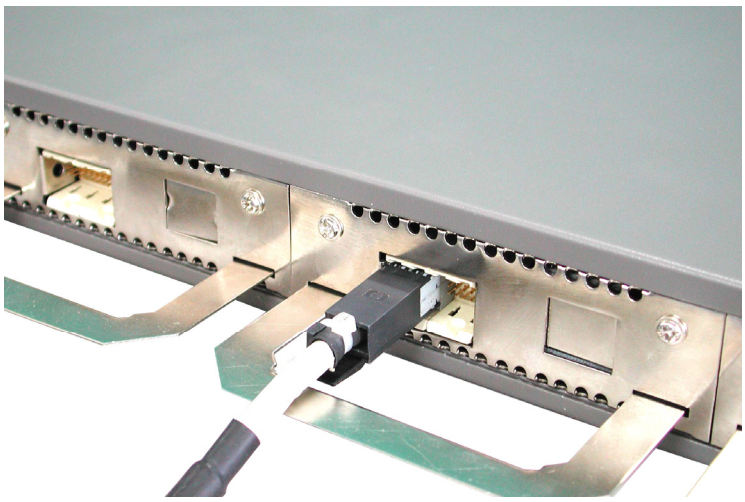


Fig. 2-3-2 E1 tributaries interface

Fig. 2-3-3 the cable for 4xE1

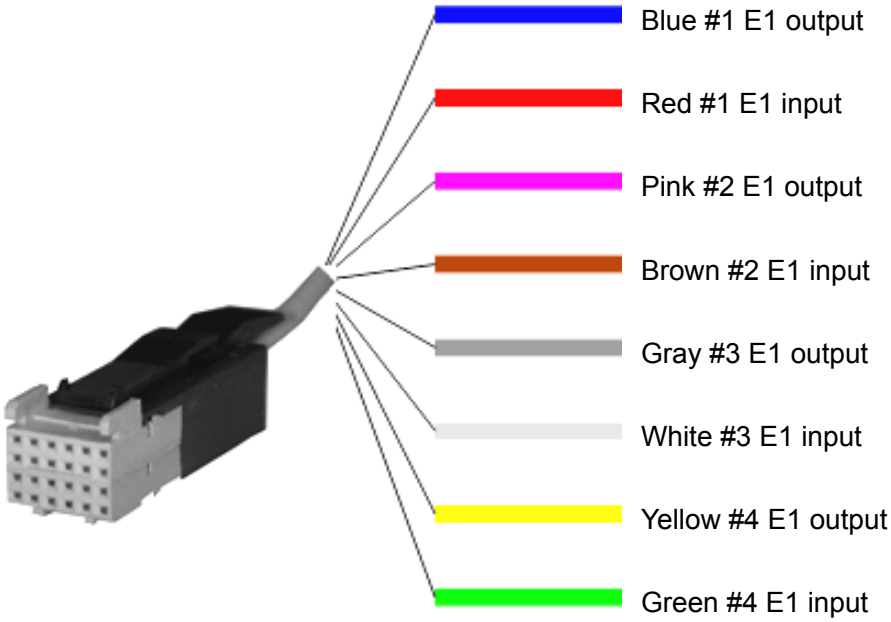

Blue #1 E1 output
Red #1 E1 input
Pink #2 E1 output
Brown #2 E1 input
Gray #3 E1 output
White #3 E1 input
Yellow #4 E1 output
Green #4 E1 input

Fig. 2-3-4 E1 cable pin-out

STM-1 optical interfaces of Simple 21E1-155M-SDH are in two groups, located at the right side of back panel; the interface is SC, the client should declare before ordering if SC is needed. Simple 21E1-155M-SDH is equipped with FC interfaces.

The DC power interfaces of Simple 21E1-155M-SDH adopt three-line binding posts, used for access-48VDC and PGND (protected ground), located at the left side of the Back Panel.

3. Network Applications

3.1 Point to Point network

The default application of Simple 21E1-155M-SDH is point-to-point.

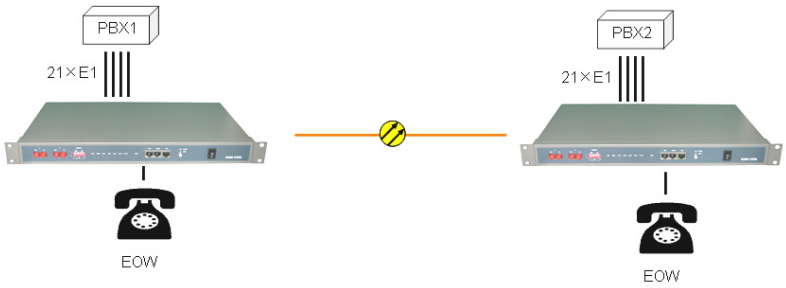


Fig. 3-1 Point to Point Network

3.2 Short Line network

Simple 21E1-155M-SDH supports the simple chain network which contains 5 NE at most.

Fig. 3-2 Simple Chain Network

4. System Installation and Operation

4.1 Equipment installation

4.1.1 Unpacking

The operator should check the completeness of equipment packaging, possible transport damage of equipment, and check correctness of equipment model and completeness of parts according to the Packing List. In case of severe defection, installation should be immediately stopped, and should contact the supplier.

4.1.2 Equipment installation

Simple 21E1-155M-SDH should be installed on 19 inch standard rack. Using 4 M6×12 bolts and through 4 mounting holes at both sides of equipment front panel, fix the equipment

on the rack. The equipment adopts natural wind cooling. In case of installation of multiple equipments, it should keep upward/downward spacing of at least 1U for the equipment. Single equipment can also keep flat on the desktop, but gapless stacking of multiple equipments is strictly forbidden.

4.1.3 Electrical installation

- The power switch must be set to **OFF** before power on.
- The supply voltage is -48VDC, -36VDC~-72VDC is tolerable. Out range voltage might result in equipment damage. Please verify the voltage before connecting.
- Connect the power supply to the equipment. The reverse connection of **–48VDC** and **GND** is forbidden. It will result in the damage of internal power module.
- Connect E1 cable, note the impedance matching. Within Simple 21E1-155M-SDH, it only provides 75Ω interface, **the user should declare before ordering if 120Ω connection is needed.**
- Connect optical interface. During the BER testing of tributary, FC/SC optical jumper can be used to achieve self-loop of optical port, connect TX of port A to RX, and connect RX of port B to TX.
- Connect equipment NMU interface and NMS with UTP crossover line, or connect Simple 21E1-155M-SDH serial-port to the NMS serial-port with serial cable.
- Connect EOW telephone set to 21E1-155M-SDH EOW interface.
- After connection of various cables, they must be fixed in cable slot with the belt, to avoid damage.
- Do not overexert in plug and pull of the E1 adaptor, in avoid of pins damage.
- If any fault exists, please contact the supplier.

4.1.4 Equipment grounding

As compactable equipment, the “ground” is distinguished GND from PGND; when the equipment works normally, GND and PGND should be connected to the earth ground. PGND grounding resistance should be less than 4Ω, grounding cable’s profile area should be no less than 6mm^2, so as to attain various electrical indicators and provide necessary conditions for safe and stable operating.

Notes for the operator:

1. **The Equipment case has been jointed with PGND bolt on the back panel inherently;**
2. **In the default factory mode, the E1 signal ground is connected to GND; if it is needed to be changed to PGND, the operator should open the equipment case and make the jumper changing manually, please see the following Fig.;**
3. **It is recommended for the user to connect PGND with the earth ground.**

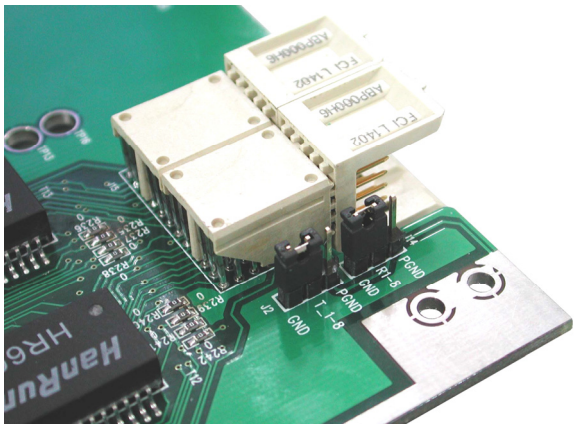


Fig. 4-1-4-1 GND Jumpers

In Simple 21E1-155M-SDH, the Earthing mode is determined by the jumper J14 and J2. In the default mode, EGNG (the signal ground of E1) is short with GND (the power ground), if it is necessary to short with PGND (the protect ground), the jumper should be changed.

Recommend schematic of System Grounding:

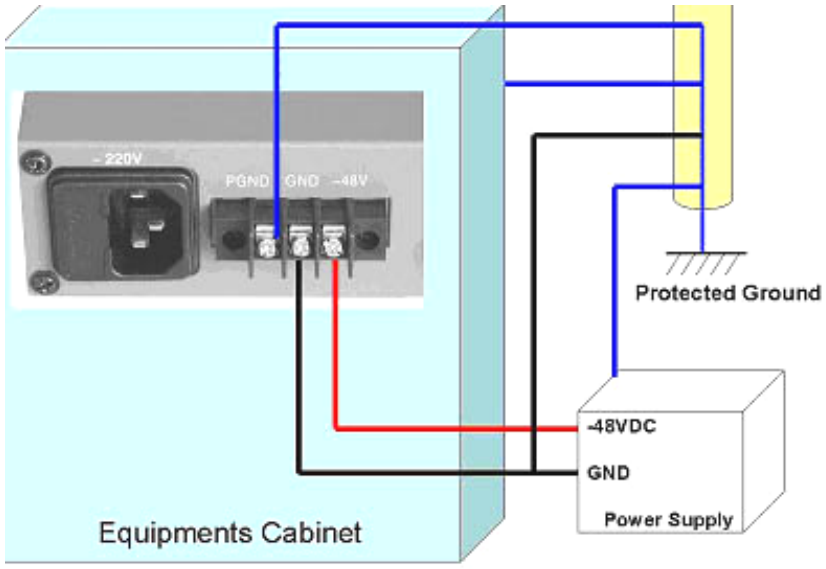


Fig. 4-1-4-2 System grounding

4.1.5 Installation of network management system

Before the operator install the SDHNMS network management system, the operator must read the user manual of SDHNMS carefully. One should set up equipment IP address (each NE should have different address) according to pre-established IP address assignment plan. Log in after the start-up of software, the default account is Administrator, password is empty. If security management is required, please enter into security management menu for account and password setting.

Note: the default IP address: 192.168.2.155, one should set the address of network management PC, which should be kept within the same network segment.

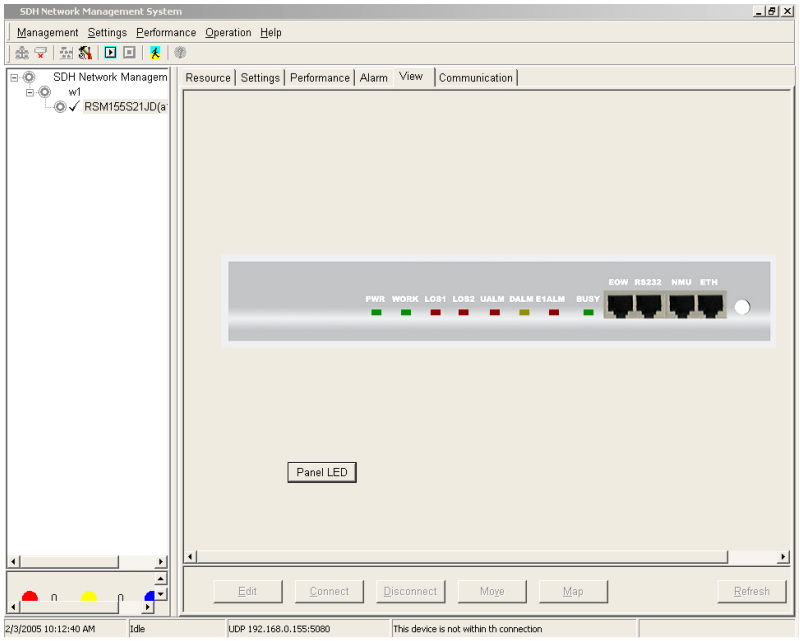


Fig. 4-1-5 Easy SDH^{TM} Management system main interface

4.2 System commission

Safety Requirement

Optical interface

In order to ensure the personnel safety during the project contacting and using laser, following rules must be observed when operating the optical equipment:

- Optical fiber should be carefully kept and cleaned; and before its connection with adapter, the connector should be covered to avoid pollutions.
- The operator must be fully trained.
- Before the system power off, do not look at the connector of the optical fiber straightly.
- Do not bend the fiber with bending radius less than 30mm.

Power interface

The input power voltage of this series product is the standard industrial voltage (48V±10%)

The commission can be defined as two stages: single-machine and network commission. First of all, the single-machine checking should be completed successfully. A clear network structure is required for network building, which should indicate connection relationship between the NEs, as well as the NE name, IP address list, EOW number list, E1 routing list and network clock synchronous plan. The E1 tributaries configuration of the Ethernet-bridge and the password list for the network management are also required.

The operator should have the qualification of Telecom Engineer. He/she is also required to familiar with equipment maintenance, Network Construction and Network Management, as while as the security regulations. After the installation of the system (including network management system) is completed, the operator must follow these procedures:

- Visual checking
- Power connection checking
- Optical interface measurement
- Electrical interface measurement
- Clock precision measurement
- EOW system testing
- Network management system testing
- BER (bit error rate) continuous testing

In order to realize test of various performance indicators, following table provides a table of recommended instruments, the operator can also choose compatible types from different vendors.

Table 4-2-1 Recommend measure instruments

Measuring instruments	Types
SDH analyzer	Anritsu MP1570A1
SDH/PDH analyzer	HP37718C
Optical power meter	TFC200
Variable optical pad	MN9611A
Multi-meter	BY1935

4.3 Network management test

The SDNNMS system shall be established after the software installation and the hardware connection are completed. The SDHNMS system implements the configuration of a Simple 21E1-155M-SDH, it also gives the alarms and performance records except the historic records.

4.4 E1 tributary protection switch

Evaluation switch request:

Alarms: LOS/LOF/LOM/AU-LOP/MS-AIS/AU-AIS/HP-AIS.

Performance: MS-EXC (10^{-3})/MS-DEG (10^{-6}).

When the Bidirectional transmission condition is available, the system determines the switching from the failure optical port to the normal one by compare the alarm or the performance evens. All the E1 tributaries involved will be switched to the other optical port.

5. Technical Parameters

5.1 Mechanical dimensions

Dimensions: 481mm (L) x 305mm (W) x 44mm (H), (contains the handle edges)

Weight: 3.76Kg

5.2 Environmental requirements

Power supply: -48 VDC±10%

Fully equipment power consumption: 10W±10%

Operating temperature: 0°C~45°C

Humidity: ≤90% (free from condensing)

Atmospheric pressure: 70~106 Kappa

Storage temperature: -20°C ~70°C

Ambient air: free from corrosive gas and soluble gas, or dust nuisance, and without strong electromagnetic field in the vicinity

5.3 Interface features

5.3.1 STM-1 optical interface

Table 5-3-1 Technical indicators of STM-1 optical interface

Bit Rate	155.520Mb/s±4.6ppm
Standard	ITU-T G.957/G.958
Optical fiber	ITU-T G.652/G.653, single mode
Work wavelength	1310nm (1550nm is optional)
Relay-free transmission range	50Km (70~100Km transmission distance available, the user should declare before ordering)
Sensitivity	Better than -36dB
Connector	FC (SC is optional, the user should declare before ordering)
Interface	S-1.1

5.3.2 E1 tributary interface

Table 5-3-2 E1 tributary interface

Bit Rate	2.048Mb/s±50ppm
Encoding	HDB3
Standard	ITU-T G.703
Connector	2mm high density connector
Impedance	75Ω non-balanced (120 Ω balanced is optional)
Jitter performance	Comply ITU-T G. 823

5.3.3 Engineer Order Wire (EOW) interface

Table 5-3-3 EOW interface

Bit Rate	64Kb/s
Signaling mode	Dual tone multi-frequency dialing mode
Ring frequency	450Hz
Ring mode	Loudspeaker
NE address range	00~99
Interface	RJ-45

5.3.4 Serial NMU (RS-232) interface

Table 5-3-4 Serial NMU

Bit Rate	19200b/s
Interface	RJ-45

5.3.5 Ethernet NMU (RJ-45) interface (optional)

Table 5-3-5 Ethernet NMU

Bit Rate	10/100M
Mode	Full/half duplex auto-negotiation
Interface	RJ-45

5.3.6 Timing mode

Simple 21E1-155M-SDH supports free-run timing mode.